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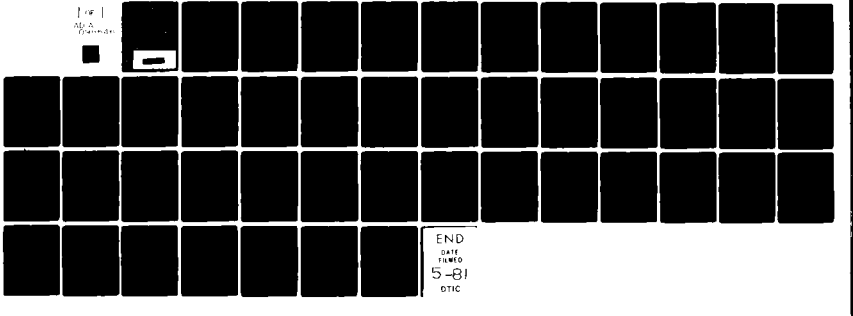

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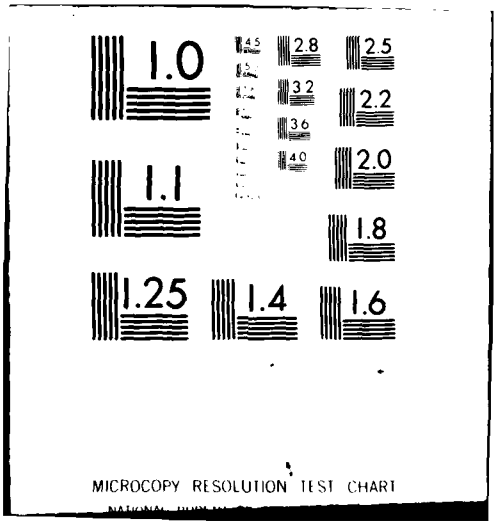
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TASK 6 REPORT

DEVELOPMENT OF WWMCCS INTERFACE IMPLEMENTATION CONCEPT

WORLDWIDE CRISIS ALERTING NETWORK, PHASE II

October 1980

Prepared for
DEFENSE COMMUNICATIONS AGENCY
WASHINGTON, D.C. 20305
under Contract DCA100-80-C-0010

ARINC RESEARCH CORPORATION

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ARINC Research Corporation is developing a system architecture for the Phase II Worldwide Crisis Alerting Network (WCANII). The objective of the program is to provide communication connectivity between specified U.S. and allied military and civilian subscriber groups.

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by

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EXECUTIVE SUMMARY

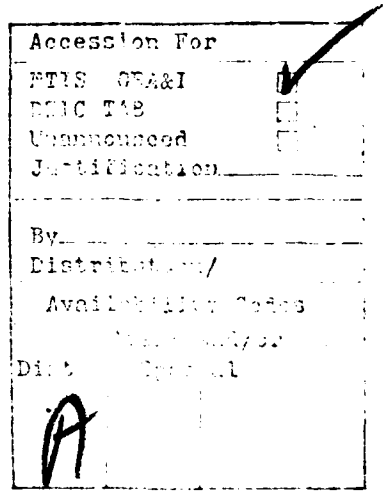
This sixth Task Report describes the resources and steps necessary to implement and operate the WCAN II and also provides a more detailed description of necessary agreements and arrangements than was provided in the Task 4 Report. Pilot system and operating system test procedures are described together with the projected resources required to conduct the tests. In addition, this report suggests future areas for improvement and expansion of the WCAN II system after actual operation has proven the effectiveness of the system.

The pertinent findings documented in this report are as follows:

- A series of eight steps, to be conducted over two years, are required to implement the WCAN II
- The estimated total cost to implement the WCAN II is estimated at $400,000
- The annual operating cost, including semi-annual system tests, is estimated at $8,000
- The WCAN II can be in operation for U.S. based organizations in fifteen months
- Formal agreements will be required between the U.S. and its NATO allies
- No formal agreements or arrangements are required for U.S. based organizations beyond their approval of operating procedures issued by related agencies (FAA, MarAd)

- A "Multi-Agency Memorandum of Understanding" is recommended for the continuing cooperation of non-Dod government agencies
- Implementation is simplified and implementation cost is minimized by the design requirements to use existing subscriber communications systems and no additional equipment

In summary, it appears that the WCAN II can be operational in a relatively short time frame and the costs to implement the system are insignificant when compared with the potential benefits of a worldwide crisis alerting network.



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CHAPTER ONE

INTRODUCTION

ARINC Research Corporation is developing a system architecture for the Phase II Worldwide Crisis Alerting Network (WCAN II) under contract DCA100-80-C-0010 for the Defense Communications Agency. The objective of the program is to identify alternative procedures and means to provide communications connectivity between specified U.S. and allied military and civilian subscriber groups. The effort encompasses the simplification and standardization of the means associated with the submission of crisis alerting messages so that they can be handled more reliably and expeditiously than is currently possible. The project will examine the telecommunications systems currently serving each subscriber group and, for each such telecommunications system, postulate interface methods and procedures. The resulting interface methods and procedures will permit incidents that are first recognized outside the military, to be reported quickly and efficiently to the proper authorities.

Five previous interim reports have been prepared which covered the activities associated with Task 1 (Review of Related Work), Task 2 (Identification of Existing Communications Systems), Task 3 (Assessment of WWMCCS Interfaces), Task 4 (Estimation of Interface Development Resources), and Task 5 (Recommendation of Preferred Interface Procedures). This report addresses the results of our effort on Task 6 (Development of WWMCCS Interface Implementation Concept).

1.1 OBJECTIVES OF TASK 6

The primary purpose of Task 6 is to describe the resources and steps necessary to implement and operate the WCAN II. The results of this task, together with the results of the previous five tasks, will serve as inputs to Task 7 (Preparation of Final Report).

1.2 CONDUCT OF TASK 6

The conduct of Task 6 encompassed performance of the following six subtasks:

- Develop an Implementation Approach

  This subtask required review of the preliminary implementation approach developed in Chapter Three of the Task 4 report and refinement of the approach as required by the WCAN II interfaces described in the Task 5 report.

- Identify Implementation Resources Required

  This subtask was based on evaluation of the cost of the WCAN II interface implementation approach developed in the previous subtask.

- Describe Necessary Agreements/Arrangements

  This subtask required review and finalization of the requirements for agreements/arrangements described in the Task 4 report for the subscriber systems selected as candidates for WCAN II participation.

- Develop System Test Procedures

  The objective of this subtask was to identify the required WCAN II test procedures, considering the following four elements:

  - Testing intervals and duration

- Description of test message content and procedures
- Requirement for "on-site" testing from aircraft and vessels
- Manned versus unmanned testing activities

• Describe System Expansion Approach

- Description of system expansion approaches
- Description of system improvement approaches

• Prepare Task 6 Report

This report is the result of the completion of this subtask. The basic information used in this task was developed in Tasks 4 and 5, supplemented as described in the five preceeding subtasks.

1.3 ORGANIZATION OF THE REPORT

Chapter One of this report has served as an introduction to the Task 6 effort. Chapter Two describes the implementation approach, together with finalized descriptions of the necessary agreements/arrangements for the candidate subscriber communications systems. The resources required to implement and operate WCAN II are discussed in Chapter Three. Chapter Four describes the system test procedures and Chapter Five presents a recommended approach to ensure continuing expansion and improvement of WCAN II. Chapter Six describes the conclusions reached as a result of the completion of this task. Appendix A presents a list of abbreviations and acronyms pertinent to this report.

CHAPTER TWO

WCAN II IMPLEMENTATION APPROACH

2.0 INTRODUCTION

This chapter describes the WCAN II implementation approach in more detail than was provided in Chapter Three of the Task 4 report. As indicated in Figure 2-1, the implementation approach consists of eight steps, as follows:

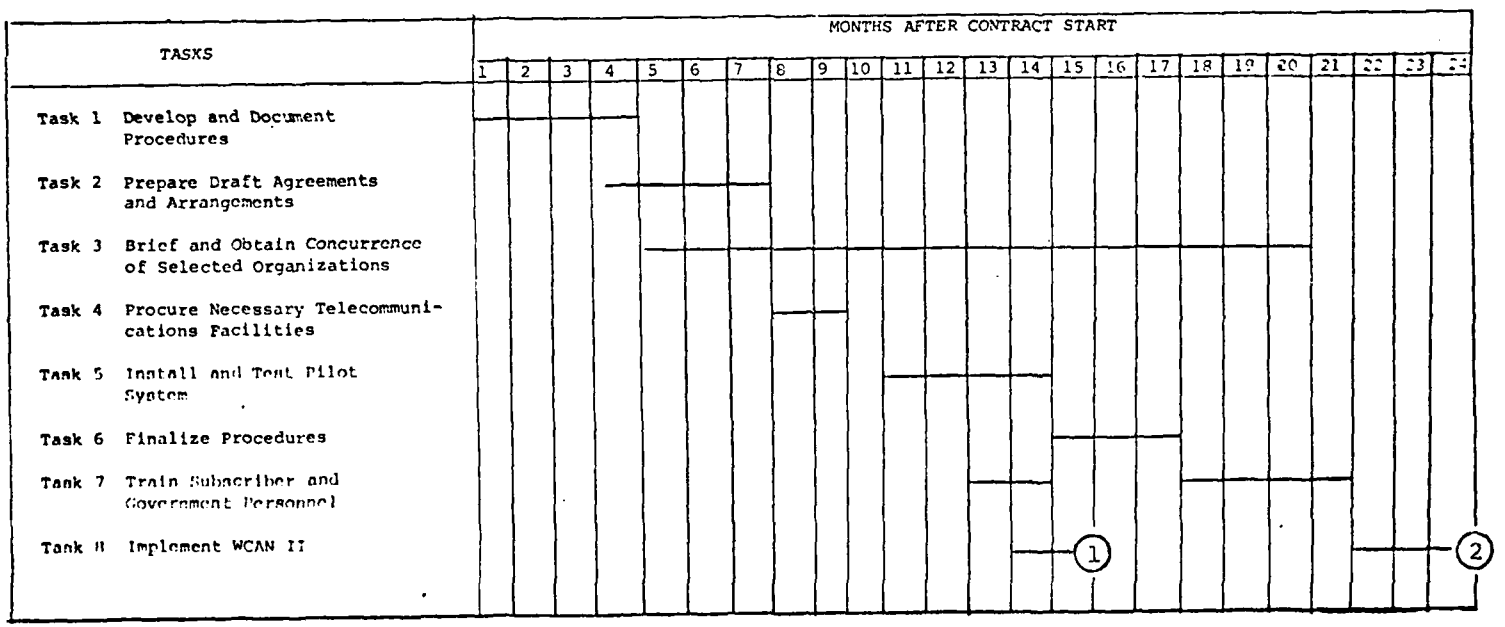
- Develop and Document WCAN II Procedures
- Prepare Draft Agreements and Arrangements
- Brief Selected U.S. Subscriber Groups and U.S./NATO Affiliated Organizations and Obtain Subscriber Concurrence
- Procure Necessary Telecommunications Facilities
- Install and Test Pilot System
- Finalize Procedures
- Train Subscribers and Government Personnel
- Implement and Maintain WCAN II

The eight steps of the implementation approach are described in the paragraphs that follow.

2.1 DEVELOP AND DOCUMENT WCAN II PROCEDURES

In this step, detailed procedures for communicating from the message originator will be developed, reviewed with CCTC, revised as necessary and documented in draft form for review with representative subscriber groups.

FIGURE 2-1. WCAN II IMPLEMENTATION SHCEDULE



(1) U.S. Based Organizations Operational

(2) NATO Allies Operational

The operating procedures for aircraft, vessels and offshore oil platforms should be prepared on card stock no larger than 8 1/2" x 11" for use by radio operators and commanding officers. The procedures card should be coated with clear plastic in order to minimize wear.

Procedures to be followed at the AUTODIN Message Centers receiving the Crisis Alerting Messages should be documented in a form and format consistant with similar government documents.

2.2 PREPARE DRAFT AGREEMENTS AND ARRANGEMENTS

Necessary agreements and arrangements leading to participation in WCAN II will be both formal and informal. As discussed below, formal agreements will probably be required in the case of the NATO and NATO ally communications systems while informal arrangements will probably suffice for the U.S. commercial non-DoD government agencies.

2.2.1 U.S. Commercial Airlines

Based on discussions held with representatives of ARINC and the Air Transport Association, it appears that no formal agreements are necessary to implement WCAN II. Approved operating procedures would serve as the basis for U.S. Commercial Airline and ARINC cooperation. The approved operating procedures would be published by the FAA and distributed to the airlines (Refer to 2.2.5).

2.2.2 NATO Ally Commercial Airlines

Formalized agreements will most likely be required for NATO ally commercial airline participation. As discussed earlier in the Task 4 report, it is likely that cooperation can be obtained from several NATO allies, prior to full NATO concurrence with the WCAN II concept. Therefore, the development of the arrangements could be approached in two phases:

- Phase 1 - Approach Canada as a WCAN II participant since they are an existing participant in the JANAP 146 E agreement covering crisis alerting by military aircraft. Following preliminary discussions with Canada, and assuming the discussions are fruitful, commence discussions with the United Kingdom and West Germany.
- Phase 2 - Present the draft agreement to the U.S. representatives of the Committee for European Airspace Coordination (CEAC) in DoD. After review and informal discussion, the U.S. CEAC representatives will be able to determine those steps necessary to obtain overall NATO ally airline participation in the WCAN II.

2.2.3 U.S. Commercial Vessels

Based on discussions with U.S. Commercial Vessel operators, it appears that no formal agreements are necessary to implement WCAN II. The development and approval of operating procedures would serve as the basis for agreement with U.S. Commercial Vessel operators. Ultimately, approved procedures would be submitted to MarAd for publication and distribution (Refer to 2.2.5).

2.2.4 NATO Ally Commercial Vessels

Formalized agreements will most likely be required for NATO ally commercial vessel participation. As discussed in the Task 4 report, it is likely that cooperation can be obtained from several NATO allies, prior to full NATO concurrence with the WCAN II concept. As in the case of NATO ally airlines, Canada is a participant in current JANAP 146 E for crisis alerting from military vessels. The development of arrangements could be approached in two

phases similar to those described in Section 2.2.2 except that the National Security Plans Office of MarAd would act as the overall NATO ally commercial vessel interface.

2.2.5 Non-DoD Government Agencies

While no formal agreement or arrangement would be required with non-Dod government agencies, a Multi-Agency Memorandum of Understanding should be prepared to include the Federal Aviation Administration, Coast Guard and Maritime Administration. The memorandum of understanding should include at least the following:

- Purpose - Description of WCAN II service, relationship between agencies and the need for inter-agency cooperation.
- Background - Description of the development of WCAN II and expected benefits to both subscribers and the nation.
- Relationships - Description of the need for mutual agency support and assistance in the handling of crisis alerting messages.
- Responsibilities - Description of the activities of each agency (e.g., message processing, procedures publication, etc.).
- Effective Date - The date on which activities with the agencies would start.
- Signature - To be signed by appropriate representatives of the Department of Defense, Federal Aviation Administration, Coast Guard and Maritime Administration.

2.2.6 U.S. Offshore Petroleum Industry

Based on discussions with representatives of the U.S. offshore petroleum industry, it appears that no formal agreements are necessary to implement

the WCAN II. Various petroleum industry representatives have indicated a willingness to participate in the development and approval of operating procedures. The most direct approach for developing these procedures would be through the American Petroleum Institute (API) Telecommunications Committee whose membership includes operators of tankers and other industry related vessels as well as offshore oil platforms.

2.2.7 NATO Integrated Communications System

The communications system serving NATO military and other government communications requirements is the NATO Integrated Communications System (NICS). The NICS could serve as an important element of WCAN II. However, crisis alert messages probably could not be transmitted over NICS into AUTODIN without the approval of all the thirteen NATO member countries. In as much as formal agreements will be required with NATO, draft agreements should be prepared and reviewed by the OASD (C^3I - Communications Systems) Office before introducing the agreements into the NATO arena. In addition, the draft agreement should be discussed with the Office of the Director for Strategic and Theater Command and Control in OASD. These discussions should result in an approach which would be the most effective and least time consuming to obtain overall NATO agreement.

2.3 BRIEF SELECTED U.S. SUBSCRIBER GROUPS AND U.S./NATO AFFILIATED ORGANIZATIONS AND OBTAIN SUBSCRIBER CONCURRENCE

Briefings will be held to inform selected U.S. subscriber groups and U.S./NATO affiliated organizations concerning the projected WCAN II system in order to gain their support and participation. During these briefings,

the draft subscriber operating procedures will be made available to the selected groups for their review and concurrence. It is anticipated that this task would consist of two approaches: review and concurrence by U.S. subscriber groups in the near term, and review and concurrence by NATO allies over a longer term.

Organizations that have indicated interest in participating, at least through the review of the WCAN II procedures, are as follows:

- Federal Aviation Administration (FAA)
- Aeronautical Radio Inc. (ARINC)
- Maritime Administration (MarAd)
- U.S. Lines
- American Petroleum Institute (API)
- Standard Oil Company of California (CHEVRON)
- Gulf Oil Company

Briefings to U.S. commercial organizations would include the following:

- Commercial Airlines
  - FAA
  - ARINC
  - ATA
  - Interested Airline Companies
- Commercial Vessels
  - MarAd
  - AIMS
  - CASO
  - USCG

- Interested Vessel Operators

. Non DoD Government Agencies

- FAA
- USCG
- MarAd

. U.S. Offshore Petroleum Industry

- API
- Interested Petroleum Companies

2.4 PROCURE NECESSARY TELECOMMUNICATIONS FACILITIES

Additional telecommunications facilities will be required at an AUTODIN Message Center (AMC) designated as the interface for communications sent by commercial means. The additional communications facilities required are:

. Telephone

. TWX

. TELEX

. Registered Cable Address

The telephone, TWX and TELEX facilities will involve a one-time expenditure for installation and a recurring monthly charge. The Registered Cable Address involves an annual charge for continuing registration.

2.5 INSTALL AND TEST PILOT SYSTEM

Installation of a pilot system for testing the WCAN II subscriber operating and interface procedures will require some minor modifications to existing airline subscriber communications systems in addition to the telecommunications facilities described in paragraph 2.4. These minor modifications would consist of the addition of a station address code to direct the messages from aircraft to the AUTODIN Message Center located at the FAA/AFTN Switching

Center in Kansas City. New address codes may be required for AFTN, ARINC, and FAA depending upon the final equipment arrangements (locations). Upon completion of these minor modifications and installation of the additional telecommunications facilities, the WCAN II will be ready for a pilot test.

The pilot test will allow each subscriber communications system to be tested. These subscriber systems are AFTN, ARINC and FAA for aircraft and MARISAT, USCG and commercial ship-shore radio for vessels and offshore oil platforms. The test procedures should exercise the entire WCAN II communications process including the crisis alert message and associated acknowledgement, query and response messages. It is assumed that the initial pilot system tests will be conducted with U.S.-flag aircraft, vessels and offshore oil platforms since these subscribers could be put on-line more rapidly than NATO-ally organizations.

2.6 FINALIZE PROCEDURES

It is to be expected that the individuals taking part in the pilot test will have suggestions regarding improvements to the WCAN II procedures. Further, it is assumed that NATO-ally organizations will also provide comments relative to the procedures, as a result of the ongoing discussions with these organizations. All comments relative to the procedures will be analyzed, reviewed with CCTC and final procedures documented. Distribution of the final procedures to U.S. organizations will be through appropriate government agencies.

2.7 TRAIN SUBSCRIBERS AND GOVERNMENT PERSONNEL

Following completion of the pilot system test and development of the finalized procedures, a training program and schedule will be developed in order to familiarize government personnel and representative subscriber

organizations with the use of the WCAN II procedures. It is assumed that several different training sessions will be required for the various subscriber organizations in both the U.S. and NATO-ally countries.

2.8 IMPLEMENT AND MAINTAIN WCAN II

After finalized procedures have been distributed and training completed, formal implementation will be preceeded by a test program similar to the pilot system test described in Section 2.5. The purpose of the test program will be to confirm that WCAN II is operational. Semi-annual testing should be a part of the ongoing system maintenance requirements and minor procedure modifications are to be anticipated.

In the test, each element of the WCAN II will be exercized. Test crisis alert messages (CAMs) will be transmitted from selected aircraft, vessels, etc. from selected points around the globe using various telecommunications methods (HF, MARISAT, Cable, etc.). The complete communications test procedure will also include the transmission of acknowledgement, query and response messages.

Following the system implementation, semi-annual tests should be conducted with different participants in different global areas. These tests will be required since the transmission volume of CAMs is expected to be low and low usage will tend to reduce the personnel awareness of WCAN II procedures.

2.9 WCAN II PROCEDURES DEVELOPMENT, TEST AND IMPLEMENTATION SCHEDULE

The eight steps (tasks) to implement the WCAN II, described in this Chapter, will require an elapsed time of approximately two years, as shown earlier in Figure 2-1 "WCAN II Implementation Schedule". Reference to Figure 2-1, shows two implementation periods. The first implementation period, indicates that the WCAN II would be operational for U.S. based organizations at the end of fifteen months. The second implementation period indicates the WCAN II would be fully operational, including NATO allies, at the end of two years.

There would be significant advantages to the WCAN II implementation in two steps as follows:

- The system would be available nine months early for U.S. based organizations with some 2,730 aircraft and 840 vessels providing test and operational data for system evaluation.
- Some valuable crisis alerting information might be provided during this nine month period.
- The WCAN II system would be effectively "debugged", prior to the addition of the NATO allies, since all nations (including the United States) would use the same telecommunications systems such as AFTN and MARISAT.

CHAPTER THREE

RESOURCES REQUIRED FOR THE IMPLEMENTATION AND OPERATION OF WCAN II

3.0 BACKGROUND

The WCAN design requirements (as published in Section 4 of the Draft Engineering Plan for the WCAN, Phase I) have had a significant impact on the required WCAN II implementation resources. Discussion of the following four design requirements will serve to illustrate this point:

- Global Coverage
- Timeliness
- *No Requirement for Additional Equipment*
- Guaranteed Message Delivery and Positive Acknowledgement of Message Receipt

Global Coverage

The majority of the required implementation resources are a result of the need to obtain cooperation with the U.S. and NATO ally subscriber groups and organizations since global coverage can be enhanced through such cooperation. This does not mean that if a particular nation refused cooperation that global coverage would not be achieved. It does mean that if France, for example, refused to cooperate, there would be fewer aircraft and vessels from which observations could be made.

Timeliness

Timeliness in the reporting and evaluation of crisis events was a matter of prime consideration in the evaluation of subscriber communications systems

in meeting the WWMCCS requirements. However, the timeliness requirement does not have an impact on implementation costs because existing subscriber communications systems are to be used as the WCAN II communications elements. Thus, the timeliness of message delivery is a function of each of the existing subscriber communications systems and, since no changes to these systems are to be made, no specific implementation resources are required.

No Requirement for Additional Equipment

The design requirement prohibiting the addition of equipment appears to be, at least initially, worthwhile since it has forced the use of existing systems that do have terminations in the vicinity of existing AUTODIN Message Centers (AMCs). However, this same constraint has required subscriber communications system/AUTODIN interface procedures that are essentially manual and hence somewhat time consuming. It should be noted that communication with aircraft is normally by voice and a manual operation is therefore required in any event, to convert the voice message into hard copy. System tests will give some indication of the benefits that might be derived from changing the interface procedures by the installation of additional AUTODIN equipment in existing subscriber system control centers.

Guaranteed Message Delivery and Positive Acknowledgement of Message Receipt

Guaranteed message delivery and positive acknowledgement of message receipt is common practice with business systems; the majority of the selected subscriber communications systems are business systems. Since no changes are required for the normal operating practices of the subscribers, the only additional resources that will be required are in the hours spent by the operating personnel at the subscriber communications system/AUTODIN interface for message

processing.

3.1 IMPLEMENTATION RESOURCES REQUIRED

As stated in Section 3.0, the majority of resources required to implement WCAN II will be expended in obtaining cooperation of the selected subscribers. Technical personnel will be required to prepare drafts of the interface and operating procedures, as well as the final procedures. Technical personnel will also be required to conduct briefings in the U.S., Canada and Europe as well as to train operating personnel and supervise tests. It is estimated that approximately 7,000 hours of technical personnel time will be required to implement WCAN II. (Implementation costs are summarized in Section 3.4)

3.1.1 Commercial Airlines

Commercial Airlines will transmit all CAMs via the FAA, AFTN and ARINC subscriber systems to the FAA/AUTODIN interface in Kansas City. Assuming that a new address code must be entered on each of the three subscriber systems at a cost of approximately $20 each, a total cost of $60 will be incurred.

3.1.2 Commercial Vessels and Offshore Oil Platforms

Commercial vessels and offshore oil platforms will communicate via existing commercial means including voice, TELEX, Morse and cable via MF, HF and VHF Radio and MARISAT. Many vessel communications are handled by international communications common carriers such as RCA Globcom and Cables and Wireless. Commercial communications require communications common carrier provided facilities for service such as TWX, TELEX (Western Union), telephone (local telephone company) and registered cable address. These

installations will be made at one designated AMC in order to limit cost, simplify message processing at the interface, and simplify user operating procedures. The installation costs and annual costs are as follows:

Service	Installation Cost	Recurring Annual Costs
TWX	$150	$4,800
TELEX	100	2,000
Telephone	75	180
Cable Address	0	15
TOTAL	$325	$6,995

Commercial vessels will also communicate via the USCG. In-as-much as the USCG has a number of AMCs, the implementation resources required will be proportional to the personnel time spent in attending briefings and in operator training. Continuing costs will consist of operating personnel time for processing WCAN II messages.

3.1.3 Non-DoD Government Agencies

The FAA is an integral part of the WCAN II system since it operates communications services for the airlines and its existing AMC would be the AUTODIN interface for aircraft communications. The FAA implementation resources required would be related directly to the personnel hours expended in attending briefings, assisting in approval of the interface and operating procedures as well as the time of operating personnel in training and operation of the interface procedures. In addition, some costs are associated with the FAA's publishing and distributing the operating procedures to airline

companies.

The USCG is also an integral part of the WCAN II system since its aircraft and vessels would serve as observer platforms, it handles communications with vessels at sea and its existing AMCs would provide the AUTODIN interface. The USCG implementation resources required would be essentially personnel hours expended in a manner similar to the FAA.

MarAd implementation resources would be expended primarily in the publication and distribution of operating procedures to vessel operators. Some minimal personnel hours would be required to attend briefings and assist in the operating procedures approval process.

3.1.4 NATO and NATO Allies

Significant technical personnel time is expected to be required to obtain the cooperation of NATO ally commercial aircraft and vessel operators as well as the use of the NATO Integrated Communications System (NICS). No additional equipment or software is required to integrate the NATO allies into WCAN II since their aircraft and vessels use the same communications modes as U.S. aircraft and vessels and NICS/AUTODIN interfaces presently exist in Europe and the United States.

3.2 CONTINUING SYSTEM OPERATION, MAINTENANCE AND TEST RESOURCES REQUIRED

Since no new equipment is to be installed in the early stages of WCAN II, no equipment maintenance will be required. System costs will consist solely of personnel time in processing messages (CAM, acknowledgement, query and response). It is difficult to estimate the number of operational messages that might be processed on an annual basis but for estimating purposes, one crisis alerting message group is projected per week. In the Task 3 Report,

a series of four messages (comprising a message group) were depicted between a vessel and an AMC. The message group began with the originated CAM followed by an acknowledgement/query message from the AMC, a response from the vessel and a response from the AMC. For the purposes of analysis, we will assume that each message consists of a total of 150 words, each message must be fully typed by the AMC operator, the AMC operator types at 30 words per minute and, 30 minutes is required to establish contact with the vessel for each message sent from the AMC. The AMC operator time expended for each message group would be as follows:

- AMC operator typing time, 4-150 word messages at 30 words per minute = 20 minutes
- AMC operator contact establishment time, two messages at 30 minutes = 60 minutes
- Total AMC operator time required per week = 80 minutes
- Total AMC operator time required per year = approximately 70 hours

Semi-annual system test resource expenditures would consist of AMC operator and technical personnel time which would be required to collect test data and analyze the results. It is suggested that a total of eleven message groups be transmitted in each test (4 - aircraft, 3 - vessels, 2 - offshore oil platforms and 2 - NATO). Each test would require selection of different points on the globe each six months. Each test would require about 13 hours of AMC operator time but it would be distributed between several AMCs (Reference Chapter Four for detailed test procedures.)

3.3 SUMMARY OF REQUIRED RESOURCES

The resources required for the WCAN II cover implementation, operation

and maintenance. The implementation phase requires the major portion of the total resources. In order to present a more complete estimate of the total resources required, estimates of government personnel time and hourly rates are included. The hourly rates for government AMC operators are estimated at $10 per hour and supervisory/technical personnel at $30 per hour. For the purposes of this report, resource expenditures are estimated for non-Dod (FAA, MarAd and USCG) supervisory/technical personnel in the review and approval of operating procedures and government AMC operators during the initial pilot system test. After implementation, resource estimates are made for government AMC operators for system operation and the semi-annual system tests.

It should be noted that additional resources should be budgeted for one DCA management level person for the two year project.

3.3.1 Implementation Resources Required

The resources required to implement WCAN II include two major items -- technical personnel and a significant travel budget (refer to table 3-1). A description of each resource shown in the table follows:

- Technical Support - The technical personnel required to conduct the WCAN II implementation tasks described in Chapter Two.
- Non-DoD Supervisory/Technical Personnel - The technical and supervisory personnel of the FAA, MarAd and USCG engaged in the development and approval of operating procedures.
- AMC Operators - The time spent by the operators at the subscriber communications system/AUTODIN interface in processing messages.
- Domestic and International Travel - Expenditures associated with

obtaining concurrence and comments of various U.S. subscribers and NATO-ally subscribers in Canada and Europe.

- Telecommunications Services Installation - The TWX, TELEX and Telephone service installation described in Section 3.1.2.

Table 3-1. Estimated Implementation Resources

Resource	Hourly Rate	Estimated Hours	Expenditure
Technical Support	$50	7,000	$350,000
Non-Dod Technical/ Supervisory Personnel	$30	280	8,400
AMC Operators	$10	20	200
Domestic and International Travel			38,000
Telecommunications Services Installation			325
TOTAL			$396,925

This estimate of WCAN II implementation cost does not include the required DCA management level person who would be involved full time over the two year implementation period.

3.3.2 Operation and Maintenance Resources Required

WCAN II operation, maintenance and test resources required were described earlier in Section 3.2. Budgetary estimates for operation, maintenance and test are as follows:

Resource	Rate	Hours	Annual Expenditure
AMC Operators	$10	100	$1,000
Telecommunications Services			7,000
TOTAL			$8,000

In addition to the above, it is recommended that a budgetary estimate of a minimum of 80 hours per test be included for supervisory/technical DCA personnel. This personnel resource would be required to select the subscriber test units, make test arrangements and analyze the test results.

CHAPTER FOUR

DESCRIPTION OF SYSTEM TEST PROCEDURES

4.0 INTRODUCTION

This chapter provides a description of the WCAN II system test procedures. It should be noted that the WCAN program has been divided into two implementation phases. Phase I of the program (WCAN I) will focus on providing an enhanced crisis alerting system to the U.S. military. Phase II (WCAN II) will extend this capability to civilian and NATO communities. WCAN I is currently being implemented, therefore, the necessary software and hardware changes to WWMCCS will have been completed prior to WCAN II implementation.

As discussed earlier, WCAN I systems test procedures are required for both the pilot system test and for semi-annual testing of the fully implemented WCAN II. The key elements to be demonstrated during the system tests are as follows:

- Subscriber knowledge of the WCAN II operating procedures
- AMC operator knowledge of the subscriber communications system/AUTODIN interface procedures
- Subscriber communications system capabilities related to the WCAN timeliness and global coverage design requirements
- WCAN hardware/software interface performance

The procedures for the pilot system test and the semi-annual tests are designed to exercize the system elements in a manner that provides definitive test results without creating a situation which may be interpreted by

non-test participants as an actual crisis event.

4.1 PILOT SYSTEM TEST PROCEDURES

The objective of the pilot system test is to confirm that the system is operational, at least in so far as U.S. subscribers are concerned, prior to WCAN II implementation. In order to prevent the creation of a situation which might be interpreted by non-participants as an actual event, all WCAN II test messages will be limited to non-crisis type information such as date, time, etc. Each U.S. subscriber group will contribute to the test including aircraft, vessels and offshore oil platforms using, to the fullest extent possible, the selected subscriber communications systems.

Prior to the pilot system test, discussions will be held between WCAN II personnel and representatives of the subscriber groups in order to select for testing, aircraft, vessels and offshore oil platforms operating in various geographical areas of the world. The results of these discussions will establish the subscriber communications nodes that will participate in the test. In the pilot system test, one message group will be processed utilizing nine subscriber system platforms (e.g., aircraft, vessels, offshore oil platforms). Table 4-1 shows the distribution of the nine message groups, subscriber communications systems and subscriber communications system/AUTODIN interfaces to be exercized in the test.

The pilot system test procedures will be developed to include descriptions of the following:

- Subscriber operating procedures
- Subscriber communications system/AUTODIN interface procedures
- Crisis alert message format

- Acknowledgement, query and response message formats
- Data collection and analysis procedures

TABLE 4-1.

Pilot System Test Message Distribution and System Elements Exercized

Subscriber Group	Number of Message Groups	Subscriber Communications System	Subscriber Communications System/AUTODIN Interface
Aircraft	1	FAA	FAA/AFTN
	2	AFTN	FAA/AFTN
	1	ARINC	FAA/AFTN
Vessels*	1	Cable	Designated AMC
	1	HF Radio	USCG
	1	MARISAT	Designated AMC
Offshore Oil* Platforms	1	Commercial MF/HF/VHF Radio	Designated AMC
	1	MARISAT	Designated AMC

*Note: Vessels and Offshore oil platforms communicate on similar subscriber communications systems; thus the systems used may be interchanged.

4.1.1 Pilot System Test Message Content

The content of the pilot system test messages will provide the basic data required to evaluate the ability of the WCAN II system to meet the

design criteria. The test message text will contain only that information necessary for critical system evaluation, as follows:

- Identification of CAM originator
- Location of originator
- Time and date of message origination
- Course and speed or originator
- Radio frequency monitored

Figure 4-1 shows a sample of a test message exchange between the Tanker Oil King and the Cinceur WWMCCS control AMC node (Reference Task 3 Report page 6-2). Copies of all test messages will be collected at a central point for analysis.

4.1.2 Conduct of the Pilot System Test

The test should be conducted under the direction of a qualified government supervisory/technical person supported by qualified technical personnel as a test evaluation team. It is suggested that the test be scheduled in a manner that permits the test evaluation team to be present at the subscriber communications system/AUTODIN interface during the message group transmisions. Table 4-2 presents a suggested Pilot System Test Activity Schedule which would require eight days of effort including the evaluation of the test data. The total elapsed time would be extended over two weeks or more because of the need to travel from one AMC to another as noted in the description of test activity elements that follow:

- Schedule Day - Shows eight days of test activity but does not include travel time to go from one AMC location to another (i.e., a full day of travel might be required between the FAA/AFTN AMC in Kansas City

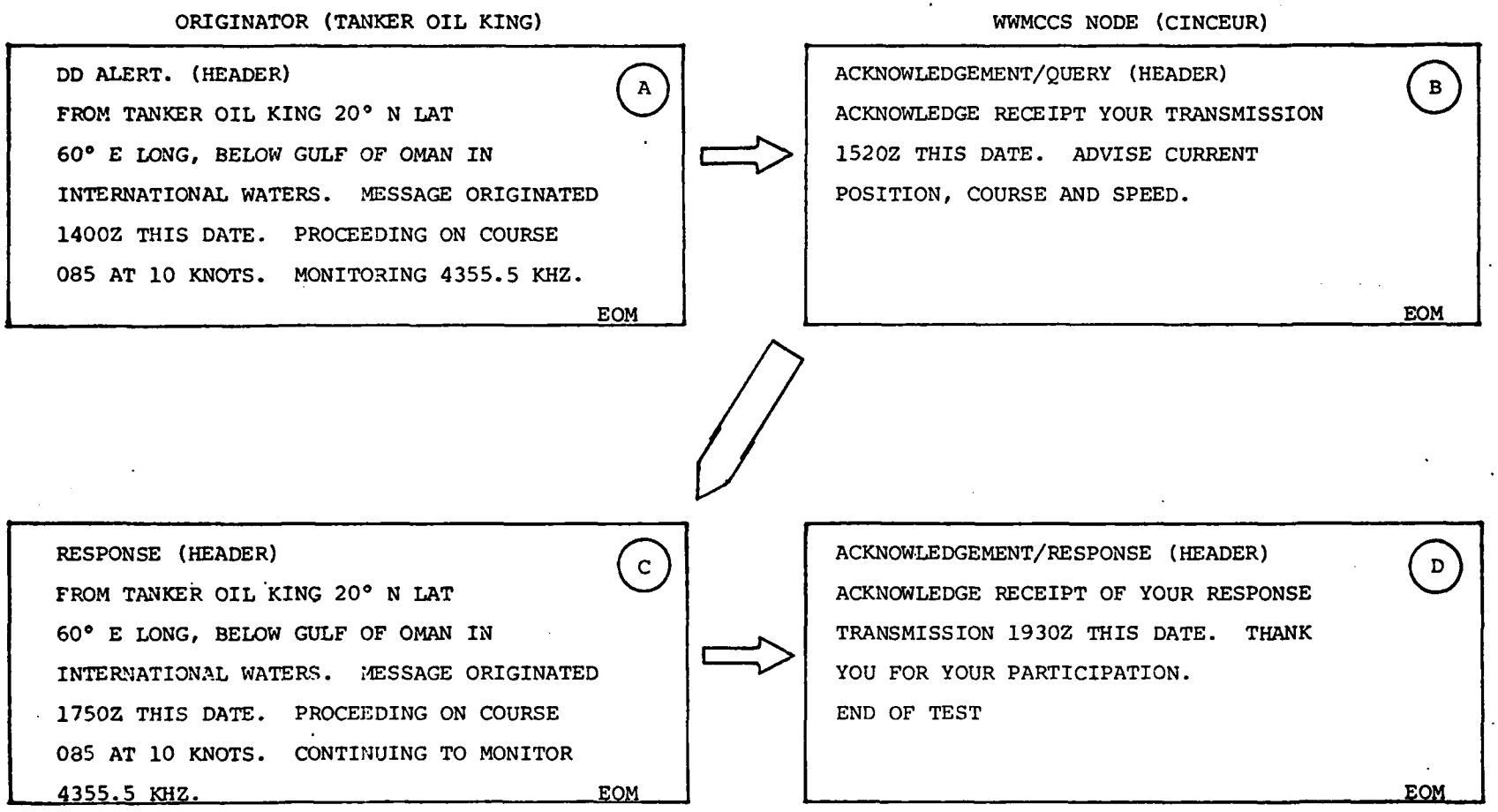


Figure 4-1. SAMPLE TEST COMMUNICATIONS EXCHANGE

Table 4-2.

Pilot System Test Activity Schedule

Schedule Day	Activity	Subscriber Group	Interface Location	Number of Message Groups	AMC Operator Hours	Test Team Hours
One	Message Group Transmission	Aircraft	FAA/AFTN	4	5.33	8
Two	Preliminary Evaluation of Test	Aircraft	FAA/AFTN	4	0	8
Three	Message Group Transmission	Vessels & Offshore Oil	Designated AMC	4	5.33	8
Four	Preliminary Evaluation of Test	Vessels & Offshore Oil	Designated AMC	4	0	8
Five	Message Group Transmission & Preliminary Evaluation	Vessels	USCG	1	1.33	8
Six through Eight	Final Evaluation of Test	Vessels, Aircraft & Offshore Oil	DCA	-	-	24

and the Designated AMC)

- Activity
  - Message Group Transmission is the transmission of the messages between each subscriber node and the subscriber system/AUTODIN interface
  - Preliminary Evaluation of Test refers to the work of the test evaluation team as a result of the data collected at the AMC processing the various message groups
  - Final Evaluation of Test includes the analysis of the complete test data and preparation of a Pilot System Test Report
- Subscriber Group - Shows the group exercized (Aircraft, Vessels and Offshore Oil Platforms)
- Interface location - The FAA/AFTN subscriber communications system/ AUTODIN interface serving the FAA, AFTN and ARINC subscriber systems is located in Kansas City, the location of the Designated AMC serving commercial MF/HF/VHF communications is to be determined at a future date, while that of the USCG AUTODIN terminal locations were shown on page 2-48 of the Task 2 Report
- Number of Message Groups - The total number of message groups to be processed for each subscriber group
- AMC Operator Hours - Assumes 80 minutes are required by an AMC operator to process each message group as described earlier in Section 3.2
- Test Team Hours - The estimated number of hours required of the test team but does not include the time required to travel between Interface Locations

4.1.3 Evaluation of Pilot System Test Data

The selection of the subscriber nodes in various areas of the globe using various subscriber communications systems will result in a practicable exercise of the WCAN II for U.S. subscribers. In order to provide reliable test data it is essential that the text of the messages contain time and location data that can be keyed to each subscriber system exercized. This subscriber communications system test data will then be combined with the AUTODIN message header time and date information to provide composite message flow, geographical, time diagrams for each system. In the test evaluation process, such detailed diagrams will point out areas for enhancement (e.g., additional or changed AMC interfaces) as well as provide information on required procedural changes.

4.2 TOTAL SYSTEM TEST PROCEDURES

The test procedures for the total system, including NATO ally aircraft and vessels and the NICS will be conducted in a manner similar to the pilot system test. The number of subscriber system test nodes may remain the same but will include NATO ally aircraft and vessels. Two NICS nodes will be added bringing the total number of message groups transmitted to eleven (Reference: Section 3.2). The purpose of the two NICS test message groups is to exercize a selected NICS/AUTODIN interface in Europe and another in the U.S. These additions will require increased AMC operator time in Europe and the U.S. (80 minutes per message group, Reference: Section 3.2), add approximately eight hours to the test evaluation process.

In conducting the total system test, it is recommended that the test be scheduled in a manner that permits the test evaluation team to be on site at

both the NICS/AUTODIN interfaces when the test message groups are transmitted. These on-site observations will be valuable in evaluating the test results even though the total elapsed test period might be extended by as much as two weeks. In addition, these on-site observations during the total system test may obviate or reduce the need for travel to Europe during the semi-annual tests.

4.3 SEMI-ANNUAL TEST PROCEDURES

The semi-annual operational tests will be conducted in a manner similar to the total system test. The subscriber system test nodes will include at least one NATO ally aircraft and vessel and two NATO (NICS) test message groups, continuing the total number of message groups processed at eleven (Reference: Section 3.2). As described in Section 4.2, the need for the test evaluation team to travel to Europe for on-site observation of the test at the selected NICS/AUTODIN interface depends on the problems that may arise during the testing period and the need to interface directly with European personnel.

CHAPTER FIVE

WCAN II SYSTEM EXPANSION AND IMPROVEMENT APPROACHES

5.0 INTRODUCTION

Once WCAN II has been placed in operation and the system has proven to be effective, it may be cost effective to both expand and improve the system architecture. It should be noted that the WCAN II system architecture is designed in a manner that permits expansion. In addition, possible areas of improvment, discussed in the Task 3 and 5 Reports, are summarized in this chapter.

5.1 SYSTEM EXPANSION APPROACHES

WCAN II system expansion would result primarily from the interfacing of additional subscriber communications systems with the WCAN II. The basic approach to system expansion would be to analyze various additional subscriber communications systems in terms of the WCAN II criteria and select those systems which would expand the system most effectively. A preliminary listing of additional subscriber communications systems which appear to warrant investigation are as follows:

- International U.S. Subscriber Communications Systems
  - Banks (CitiCorp, Chase Manhattan, etc.)
  - Manufacturing (IBM, ITT, etc.)
  - Petroleum (Exxon, Chevron, etc.)
- Non-DoD Government Agencies
  - Department of State
- Friendly Nations*
  - Australia

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* The inclusion of aircraft and vessels of friendly nations would not require additional subscriber communications systems but would increase the opportunity for observation of crisis events.

- New Zealand

- Japan

5.2 SYSTEM IMPROVMENT APPROACHES

WCAN II system improvement approaches will most likely address the timeliness factor primarily. As described in the Task 3 Report, Section 4.4, subscriber communications system deficiencies can be enhanced through improvement of AMC accessibility. As an example, the installation of an AUTODIN terminal at selected subscriber communications system communications centers would provide the capability to reduce message transmission time.

Another system improvement approach that should be investigated is to improve the message handling time for messages transmitted via commercial MF/HF/VHF radio. Commercial vessels make extensive use of commercial radio as a matter of course. International communications common carriers operate commercial MF/HF/VHF radio and provide connections between vessels and U.S. domestic telephone, TWX and TELEX networks. Each of these services are switched, requiring time to dial and establish connection. Timeliness might be improved substantially by establishing direct circuits between the international communications common carrier U.S. shore points and the designated AMC equipped to handle these types of communications.

CHAPTER SIX

CONCLUSIONS

The WCAN II appears to be a cost effective system as a result of its relative low cost and ability to provide crisis alerting message communications virtually worldwide. Specific conclusions are provided in the following list:

- The WCAN II can be implemented as the result of an eight step program.
- The time required to fully implement the WCAN II is approximately two years.
- The WCAN II can be implemented in about 15 months for U.S. subscribers.
- No formal agreements and arrangements will be required for U.S. subscribers and non-DoD government agencies.
- Approved operating procedures, to be published by non-DoD government agencies, will be the basis for cooperation by U.S. subscriber organizations.
- A "Multi-Agency Memorandum of Understanding" should be signed by participating non-DoD government agencies and DoD.
- Formal agreements will most likely be required for NATO and NATO ally subscriber concurrence.
- The cost required to implement the WCAN II is estimated at $400,000.
- The annual cost required to operate and maintain the WCAN II is estimated at $8,000.

In summary, the WCAN II design requirements of no additional equipment and the use of existing subscriber communications systems has resulted in the design of a low cost, worldwide crisis alerting network which could be operational in the near term with U.S. based subscriber communications systems and in the longer term with NATO ally subscriber systems. As indicated previously in the Task 4 and 5 Reports, it is difficult to conceive of a global system, with such a highly qualified observer base that could be implemented for $400,000.

APPENDIX A

LIST OF ABBREVIATIONS AND ACRONYMS

AIG	Address indicator group
ALMS	American Institute of American Shipping
AFTN	Airline Fixed Telecommunications Network
ALERT	The Prosign for the AUTODIN, used for crisis alerting
AMC	AUTODIN message center
AMRIL	AUTODIN message routing indicator list
API	American Petroleum Institute
ASC	ATUODIN switching center
ASCII	American Standard Code for Information Interchange
ARINC	Aeronautical Radio Inc.
AUTODIN	Automatic Digital Network
BT	A "Break" in the AUTODIN line format to separate a line from the next line
CAM	Crisis Alert Message
CASO	Council of American-Flag Ship Operators
CCTC	Command and Control Technical Center
CIC	Communication Indicator Code
COMSEC	Communication Security
CONUS	Continental US
CR	Carriage return

CRITIC	A sentinel of the AUTODIN message; Critical intelligence communications
DCS	Defense Communication System
DD ALERT	A sentinel of the AUTODIN message
DTGZ	Date-time group ZULU
EOM	End-of-Message
FAA	Federal Aviation Administration
FIGS	FIGURES: Upshift in TTY code
FL	AUTODIN format line
GCT	Greenwich Civil Time
GMT	Greenwich Mean Time
GENSER	General Service in the AUTODIN
HF	High frequency 3 - 30 MHz
IF/F	Identify friend or foe
JANAP 128	JCS document on AUTODIN operating procedures
LF	Line feed
LTRS	LETTERS: Downshift in TTY code
MarAd	Maritime Administration
MARISAT	Maritime Satellite Organization
MEP	Management Engineering Plan
MF	Medium Frequency 300kHz-3 MHz
NATO	North Atlantic Treaty Organization
NAVCOMSTA	Naval Communication Station
NICS	NATO Integrated Communications System
OSRI	Origination Station Routing Indicator
OSSN	Origination Station Serial Number

Q/R	Query/Response
RI	Routing Indicator
ROS	Report originating station
R/SS	Relay/switching station
SITA	Societe Internationale de Telecommunications Aeronautiques
SSN	Station Serial number
SSN	Sun Spot Number
TI	Transmission Indicator
TTY	Teletypewriter
USCG	United States Coast Guard
VHF	Very high frequency 30-300 MHz
WCAN	WWMCCS Crisis Alerting Network
WSEO	WWMCCS Systems Engineering Organization
ZNR	A Security Warning Operating Signal; Unclassified
ZNY	A Security Warning Operating Signal; Classified
ZULU	Time Zone "Z", the same as GMT


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FILM